

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 06-074011

(43)Date of publication of application : 15.03.1994

(51)Int.Cl.

F01L 13/00

(21)Application number : 04-347487

(71)Applicant : MAZDA MOTOR CORP

(22)Date of filing : 28.12.1992

(72)Inventor : NISHIDA MASAMI  
FUKUMA MASANARI  
ASAI AKIRA

(30)Priority

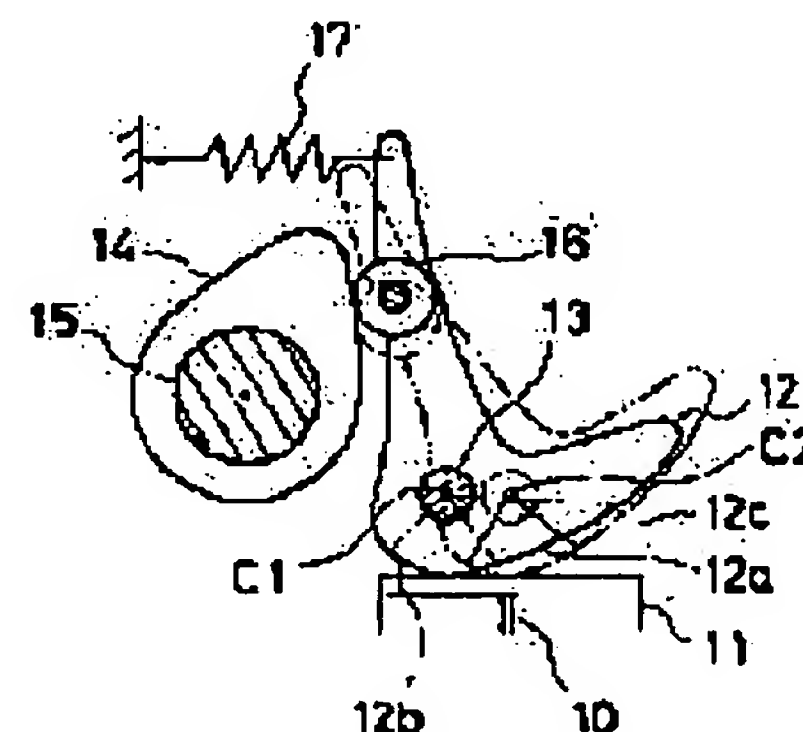
Priority number : 04177122 Priority date : 03.07.1992 Priority country : JP

## (54) VALVE TIMING CONTROLLER OF ENGINE

(57)Abstract:

PURPOSE: To reduce sliding spots necessary to rock a rocking cam for lifting an intake valve or exhaust valve of an engine.

CONSTITUTION: A rocking cam 12 is rocked sliding through a rush adjuster on an intake or exhaust valve 10 of an engine to lift the valve 10 as it is rocked. The rocking cam 12 is formed on the cam surface with a lift arcuate part not to lift the valve 10 even in sliding on the valve 10 and a lift arcuate part to lift the valve 10 in sliding on the valve 10. A driving cam 14 is supported by a driving cam shaft 15 to rock the rocking cam 12 as it is rotated. The opening and closing timing of the valve 10 is changed by the shift of the rocking center of the rocking cam 12.



## LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

**\* NOTICES \***

**JPO and NCIPi are not responsible for any damages caused by the use of this translation.**

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

**CLAIMS**

---

**[Claim(s)]**

[Claim 1] The splash cam to which it rocks in the condition of having \*\*\*\*ed on the engine bulb for inhalation of air, or the bulb for exhaust air directly or indirectly, and the lift of the above-mentioned bulb for inhalation of air or the bulb for exhaust air is carried out with a splash, The cam for actuation which it is supported [ cam ] by this cam shaft for actuation so that it may follow and rotate to the cam shaft for actuation in contact with the above-mentioned splash cam, and makes the above-mentioned splash cam rock with a revolution, The valve timing control unit of the engine characterized by having the splash cam migration means to which the center of oscillation of the above-mentioned splash cam is moved so that the closing motion timing of the above-mentioned bulb for inhalation of air or the bulb for exhaust air may change.

[Claim 2] Between the above-mentioned bulb for inhalation of air or the bulb for exhaust air, and the above-mentioned splash cam, the pressed field is in contact with the cam side of the above-mentioned splash cam, and the swing arm to which the lift of the above-mentioned bulb for inhalation of air or the bulb for exhaust air is carried out with a splash while following and rocking to the splash of the above-mentioned splash cam is prepared. The above-mentioned splash cam migration means is the valve timing control unit of the engine according to claim 1 characterized by moving the center of oscillation of the above-mentioned splash cam so that the cam side of the above-mentioned splash cam may move along the pressed field of the above-mentioned swing arm.

[Claim 3] the slide contact migration direction where this splash cam \*\*\*\*s on the bulb for inhalation of air, or the bulb for exhaust air directly or indirectly while holding the above-mentioned splash cam migration means for the above-mentioned splash cam, enabling a free splash -- a round trip -- with the splash cam attachment component prepared movable The rack prepared so that both-way actuation might be carried out in the direction vertical to the above-mentioned slide contact migration direction, It is prepared so that it may gear with this rack and may rotate with the reciprocating motion of this rack. A pinion, The valve timing control unit of the engine according to claim 1 or 2 with which the other end is screwing in the above-mentioned splash cam attachment component, and is characterized by pivotable and consisting of thread part material prepared in migration impossible to shaft orientations on the other hand with which the end section is being fixed to the above-mentioned pinion.

[Claim 4] the slide contact migration direction where this splash cam \*\*\*\*s on the bulb for inhalation of air, or the bulb for exhaust air directly or indirectly while holding the above-mentioned splash cam migration means for the above-mentioned splash cam, enabling a free splash -- a round trip -- with the splash cam attachment component prepared movable The revolving shaft established so that revolution actuation might be carried out, and the 1st eccentric member prepared so that it might rotate, where eccentricity is carried out to this revolving shaft to the center of rotation of this revolving shaft, It is prepared in the above-mentioned splash cam attachment component, and engages with the eccentric member of the above 1st. this -- the valve timing control unit of the engine according to claim 1 or 2 characterized by consisting of the 2nd eccentric member which it reciprocates [ 2nd ] with the revolution of the 1st eccentric member, and carries out both-way migration of the above-mentioned splash cam attachment component.

[Claim 5] the slide contact migration direction where this splash cam \*\*\*\*s on the bulb for inhalation of air, or the bulb for exhaust air directly or indirectly while holding the above-mentioned splash cam migration means for the above-mentioned splash cam, enabling a free splash -- a round trip -- with the splash cam attachment component prepared movable The revolving shaft established so that revolution actuation might be carried out, and the pinion prepared so that this revolving shaft might be interlocked with and it might rotate, The valve timing control unit of the engine according to claim 1 or 2 characterized by consisting of a

rack which it is prepared [ rack ] so that it may gear with the above-mentioned pinion to the above-mentioned splash cam attachment component, and it reciprocates [ rack ] with the revolution of this pinion, and carries out both-way migration of the above-mentioned splash cam attachment component.

---

[Translation done.]

**\* NOTICES \***

**JPO and NCIPi are not responsible for any damages caused by the use of this translation.**

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

**DETAILED DESCRIPTION**

---

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the valve timing control unit of the engine to which the closing motion timing of the bulb for inhalation of air or the bulb for exhaust air is changed according to engine operational status.

[0002]

[Description of the Prior Art] As a valve-timing control device of the above engines, as shown in JP,55-137306,A, it rocks in the condition \*\*\*\*ed on the bulb for pumping with the splash of the cam for actuation rotated synchronizing with a revolution of an engine, the splash lever rocked with the revolution of this cam for actuation, and this splash lever, and the thing equipped with the splash cam to which the lift of this engine bulb is carried out with a splash is known.

[0003] In the cam side of the splash cam in the valve timing control unit of this engine The basic radii section to which the lift of this bulb is not carried out even if it \*\*\*\*s on the bulb for pumping, By forming the lift radii section to which the lift of this bulb is carried out, if it is adjacently prepared in this basic radii section and \*\*\*\*s on the bulb for pumping, and moving the center of oscillation of a splash lever A lever ratio is changed and, thereby, lift \*\* of the bulb for pumping, as a result the closing motion time amount of this bulb are changed. namely, the die length of the part which \*\*\*\*s on the splash lever in the cam for actuation while a lever ratio becomes large, after the center of oscillation of a splash lever has moved to the direction of a splash cam -- a nose -- since it expands even to the near section of the section, the amount of lifts of the bulb for pumping becomes large, and the open time amount of this bulb becomes long. the die length of the part which \*\*\*\*s on the splash lever in the cam for actuation on the other hand while a lever ratio becomes small, after the center of oscillation of a splash lever has moved to the direction of the cam for actuation -- a nose -- since it is restricted to the section, the amount of lifts of the bulb for pumping becomes small, and the open time amount of this bulb becomes short.

[0004]

[Problem(s) to be Solved by the Invention] However, in the valve timing control device of the above-mentioned engine, since there are many slide contact parts in order to have to make a splash lever and a splash cam \*\*\*\* while making the cam for actuation, and a splash lever \*\*\*\*, in order to make a splash cam rock, while mechanical resistance is large, management of the path clearance of a slide contact part is difficult.

[0005] Moreover, since there are many slide contact parts and the rigidity in the transfer system of the force falls, there is a problem that an engine revolution limitation falls.

[0006] While this invention solves the above-mentioned trouble at once, reducing a slide contact part required in order to make a splash cam rock, and decreasing mechanical resistance by this and making easy management of the path clearance of a slide contact part, it aims at raising the rigidity of the transfer system of the force and raising an engine revolution limitation.

[0007]

[Means for Solving the Problem] In order to attain the above-mentioned object, invention of claim 1 changes the closing motion timing of the bulb for inhalation of air, or the bulb for exhaust air by moving the center of oscillation of a splash cam, while making a splash cam rock by the cam for actuation followed and rotated to the cam shaft for actuation.

[0008] The solution means which invention of claim 1 provided concretely The splash cam to which an engine valve timing control device is rocked in the condition of having \*\*\*\*ed on the engine bulb for inhalation of air, or the bulb for exhaust air directly or indirectly, and the lift of the above-mentioned bulb



for inhalation of air or the bulb for exhaust air is carried out with a splash, The cam for actuation which it is supported [ cam ] by this cam shaft for actuation so that it may follow and rotate to the cam shaft for actuation in contact with the above-mentioned splash cam, and makes the above-mentioned splash cam rock with a revolution, It considers as a configuration equipped with the splash cam migration means to which the center of oscillation of the above-mentioned splash cam is moved so that the closing motion timing of the above-mentioned bulb for inhalation of air or the bulb for exhaust air may change.

[0009] Invention of claim 2 arranges a swing arm between the bulb for inhalation of air or the bulb for exhaust air, and a splash cam. It is what stabilizes actuation of the bulb for inhalation of air, or the bulb for exhaust air by making this swing arm rock by the splash cam. Specifically In the configuration of claim 1, between the above-mentioned bulb for inhalation of air or the bulb for exhaust air, and the above-mentioned splash cam The pressed field is in contact with the cam side of the above-mentioned splash cam, and the swing arm to which the lift of the above-mentioned bulb for inhalation of air or the bulb for exhaust air is carried out with a splash while following and rocking to the splash of the above-mentioned splash cam is prepared. The above-mentioned splash cam migration means adds the configuration of moving the center of oscillation of the above-mentioned splash cam so that the cam side of this splash cam may move along the pressed field of the above-mentioned swing arm.

[0010] Invention of claim 3 is what limits the above-mentioned splash cam migration means. Specifically In claim 1 or the configuration of 2, the above-mentioned splash cam migration means the slide contact migration direction where this splash cam \*\*\*\*s on the bulb for inhalation of air, or the bulb for exhaust air directly or indirectly while holding the above-mentioned splash cam, enabling a free splash -- a round trip -- with the splash cam attachment component prepared movable The rack prepared so that both-way actuation might be carried out in the direction vertical to the above-mentioned slide contact migration direction, It is prepared so that it may gear with this rack and may rotate with the reciprocating motion of this rack. A pinion, The end section is the thing which is being fixed to the above-mentioned pinion and which the other end is screwing in the above-mentioned splash cam attachment component, and, on the other hand, adds pivotable and the configuration which consists of thread part material prepared in migration impossible to shaft orientations.

[0011] Invention of claim 4 is what limits the above-mentioned splash cam migration means. Specifically In claim 1 or the configuration of 2, the above-mentioned splash cam migration means the slide contact migration direction where this splash cam \*\*\*\*s on the bulb for inhalation of air, or the bulb for exhaust air directly or indirectly while holding the above-mentioned splash cam, enabling a free splash -- a round trip -- with the splash cam attachment component prepared movable The revolving shaft established so that revolution actuation might be carried out, and the 1st eccentric member prepared so that it might rotate, where eccentricity is carried out to this revolving shaft to the center of rotation of this revolving shaft, it prepares in the above-mentioned splash cam attachment component -- having -- \*\*\*\* -- the eccentric member of the above 1st -- being engaged -- this -- it reciprocates with the revolution of the 1st eccentric member, and the configuration which consists of the 2nd eccentric member which carries out both-way migration of the above-mentioned splash cam attachment component is added.

[0012] Invention of claim 5 is what limits the above-mentioned splash cam migration means. Specifically In claim 1 or the configuration of 2, the above-mentioned splash cam migration means the slide contact migration direction where this splash cam \*\*\*\*s on the bulb for inhalation of air, or the bulb for exhaust air directly or indirectly while holding the above-mentioned splash cam, enabling a free splash -- a round trip -- with the splash cam attachment component prepared movable The revolving shaft established so that revolution actuation might be carried out, and the pinion prepared so that this revolving shaft might be interlocked with and it might rotate, It is prepared so that it may gear with the above-mentioned pinion to the above-mentioned splash cam attachment component, and it reciprocates with the revolution of this pinion, and the configuration which consists of a rack which carries out both-way migration of the above-mentioned splash cam attachment component is added.

[0013]

[Function] Since it has the splash cam migration means to which the center of oscillation of a splash cam is moved by the configuration of claim 1 so that the closing motion timing of the bulb for inhalation of air or the bulb for exhaust air may change, The include angle of a splash cam in case the angle of rotation of the cam for actuation is the specified quantity changes with migration of the center of oscillation of a splash cam. Since the field which \*\*\*\*s directly or indirectly changes to the bulb for inhalation of air or the bulb for exhaust air in a cam side of a splash cam in connection with this, the closing motion timing of the bulb for inhalation of air or the bulb for exhaust air changes.

[0014] Moreover, since the direct drive of the splash cam is carried out by the cam for actuation, a splash lever becomes unnecessary and slide contact parts decrease in number.

[0015] In order to arrange a swing arm between the bulb for inhalation of air or the bulb for exhaust air, and a splash cam and to make this swing arm rock by the splash cam, even if the center of oscillation of a splash cam moves by the configuration of claim 2, it is only that the parts where the cam side of a splash cam presses the pressed field of a swing arm differ, and the part where a swing arm presses the bulb for inhalation of air or the bulb for exhaust air does not change.

[0016] By the configuration of claim 3, if both-way actuation of the rack is carried out in the direction vertical to the slide contact migration direction, a pinion will rotate, and the thread part material fixed to the end of a pinion in connection with this also rotates. Since the other end is screwing thread part material in a splash cam attachment component while it is prepared in shaft orientations at migration impossible, with the revolution of thread part material, a splash cam attachment component reciprocates in the slide contact migration direction, it follows in footsteps of this and the center of oscillation of a splash cam also reciprocates in the slide contact migration direction.

[0017] It rotates, after the 1st eccentric member has carried out eccentricity to a revolving shaft by the configuration of claim 4, when revolution actuation of the revolving shaft was carried out. In order that the 2nd eccentric member may reciprocate with the revolution of the 1st eccentric member, with a revolution of a revolving shaft, a splash cam attachment component reciprocates in the slide contact migration direction, follows in footsteps of this, and, as for the 2nd eccentric member \*\*\*\*\*, the center of oscillation of a splash cam also reciprocates in the slide contact migration direction.

[0018] If revolution actuation of the revolving shaft is carried out, since a pinion will rotate and Lack, as a result a splash cam attachment component will reciprocate in the slide contact migration direction with the revolution of a pinion by the configuration of claim 5, it follows in footsteps of this and the center of oscillation of a splash cam also reciprocates in the slide contact migration direction.

[0019]

[Example] Hereafter, although the example of this invention is explained based on a drawing, the principle of this invention is explained based on drawing 1 as the premise.

[0020] The rushes adjuster to which the bulb of the for the object for engine inhalation of air or for exhaust air in 10 and 11 carry out the opening and closing movement of the bulb 10 in this drawing, The splash cam to which 12 is rocked in the condition of having \*\*\*\*ed to the rushes adjuster 11, and the lift of the bulb 10 is carried out through the rushes adjuster 11 with a splash, The cam shaft for a splash which holds 13 for the splash cam 12, enabling a free revolution, the cam for actuation which 14 makes rock the splash cam 12 with a revolution, The cam shaft for actuation currently held free [ the revolution to an engine ] while 15 holds the cam 14 for actuation, 16 is supported by the splash cam 12 free [ a revolution ], where the cam 14 for actuation is contacted. While rotating with the revolution of the cam 14 for actuation, the roller which makes the splash cam 12 rock, and 17 are springs which make a roller 16 always contact the cam 14 for actuation by energizing the splash cam 12 to the direction of the cam 14 for actuation.

[0021] Even if it \*\*\*\*s on the rushes adjuster 11, as a result a bulb 10, perfect circle-like basic radii section 12b to which the lift of the bulb 10 is not carried out and which it is got [ b ] blocked and does not make an inlet port or an exhaust port open, and lift radii section 12c to which the lift of the bulb 10 will be carried out if it \*\*\*\*s on a bulb 10 and which it is got [ c ] blocked and makes an inlet port or an exhaust port open are formed in cam side 12a of the splash cam 12.

[0022] If the center of oscillation of the splash cam 12 moves between C1 and C2 as shown in drawing 1 , the field which the splash cam 12 when the cam 14 for actuation carries out a specified quantity revolution rocks will change. That is, when the center of oscillation of the splash cam 12 is in C2 and the splash cam 12 rocks only the same amount as compared with the case where the center of oscillation is in C1, the amount to which basic radii section 12b in cam side 12a of the splash cam 12 \*\*\*\*s on the top face of the rushes adjuster 11 increases. In connection with this, the amount to which lift radii section 12c in cam side 12a \*\*\*\*s on the top face of the rushes adjuster 11 decreases, and the amount of lifts of a bulb 10 decreases.

[0023] The amount of lifts of the bulb 10 in case drawing 2 shows change of the amount of lifts of the bulb 10 when the center of oscillation of the splash cam 12 moves and A has the center of oscillation of the splash cam 12 in C1 is shown, and B shows the amount of lifts of the bulb 10 in case the center of oscillation of the splash cam 12 is in C2. Thus, the valve timing control device concerning this invention can control the closing motion timing of a bulb 10.

[0024] Drawing 3 shows the valve timing control unit of the engine concerning the 1st example of this invention.



[0025] \*\*\*\* 1 example is a type with which the splash cams 12 and 12 of a left Uichi pair rock, and the object for two inhalation of air or the bulbs 10 and 10 for exhaust air move up and down in connection with this by the revolution of one cam 14 for actuation.

[0026] In \*\*\*\* 1 example, the arm 18 for a splash prolonged to the direction of the cam 14 for actuation is formed among the splash cams 12 and 12 of a left Uichi pair at the splash cams 12 and 12 of a left Uichi pair, and one, and the roller 16 is held free [ a revolution ] at the arm 18 for a splash.

[0027] The both ends of the cam shaft 13 for a splash which is insisting upon the splash cams 12 and 12 and the arm 18 for a splash of a left Uichi pair are held free [ a revolution on the plane view horseshoe-shaped frame 19 ].

[0028] Although the graphic display is omitted, the driving means to which it is made to move between the location which consists of oil pressure or a worm gearing, and shows a frame 19 as a continuous line, and the location shown with a two-dot chain line is established, and the splash cam migration means to which the center of oscillation of the splash cam 12 is moved by this driving means and the above-mentioned frame 19 is constituted. Therefore, if the above-mentioned driving means is operated and a frame 19 is moved, the center of oscillation of the cam shaft 13 for a splash, as a result the splash cam 12 will move, and the closing motion timing of a bulb 10 will change in connection with this.

[0029] Drawing 4 shows the valve timing control unit of the engine concerning the modification of the 1st example, and explanation is omitted by attaching the same sign about the same member as the 1st example.

[0030] In this modification, the engagement member 22 for a splash of the shape of a fork whose cam 14 for projection actuation the direction of the cam 14 for actuation pinches is formed among the splash cams 12 and 12 of a left Uichi pair at the splash cam 12 of a left Uichi pair, and one, and the engagement member 22 for a splash, as a result the splash cams 12 and 12 are rocked with the revolution of the cam 14 for actuation. The amount of lifts which is absorbed by basic radii section 12b in cam side 12a of the splash cam 12, and becomes an invalid can be reduced without strengthening spring action of the above-mentioned spring 17, if the engagement member 22 for a splash is formed like this modification.

[0031] Drawing 5 shows the valve timing control unit of the engine concerning the 2nd example of this invention.

[0032] \*\*\*\* 2 example is a type with which one splash cam 12 rocks, a swing arm 20 rocks in connection with this, and the object for two inhalation of air or the bulbs 10 and 10 for exhaust air move up and down by the revolution of one cam 14 for actuation.

[0033] In \*\*\*\* 2 example, the swing arm 20 is supported free [ a splash ] through the shaft 21 for swing arms, the pressed field 20a is in contact with cam side 12a of the splash cam 12, rocks with the splash of the splash cam 12, and the press sections 20b and 20b at a head move bulbs 10 and 10 up and down.

[0034] The arm 18 for a splash prolonged to the direction of the cam 14 for actuation is formed in the top face of the splash cam 12 at the splash cam 12 and one, and the roller 16 is held free [ a revolution ] at the arm 18 for a splash.

[0035] Moreover, while the both ends of the cam shaft 13 for a splash which insisted upon the splash cam 12 are supported by the upper bed section of the support arms 23L and 23R of a left Uichi pair prolonged in the vertical direction free [ a revolution ] and the soffit section of the support arms 23L and 23R of this left Uichi pair is connected with the support shaft 24, this support shaft 24 is held free [ the revolution to the engine which is not illustrated ].

[0036] While the spur gear 25 is formed in the soffit section of left support arm 23L, the worm gearing 26 prolonged in the direction which intersects perpendicularly with left support arm 23L is formed in the left support arm 23L bottom, and this worm gearing 26 and the above-mentioned spur gear 25 mesh.

[0037] If the splash cam migration means is constituted by the support arms 23L and 23R of a left Uichi pair explained above, the support shaft 24, the spur gear 25, and the worm gearing 26 and a worm gearing 26 is rotated A spur gear 25 moves to the shaft orientations of a worm gearing 26, and in connection with this, the support armL [ 23 ] and 23R top edge \*\*\*\*\* of a left Uichi pair moves in the center of oscillation of the splash cam 12, as cam side 12a of the splash cam 12 moves along with pressed field 21a of a swing arm 21.

[0038] Drawing 6 shows the valve timing control unit of the engine concerning the modification of the 2nd example, and omits explanation by attaching the same sign about the same member as the 2nd example.

[0039] This modification is a type with which one splash cam 12 rocks, a swing arm 20 rocks in connection with this, and the object for two inhalation of air or the bulbs 10 and 10 for exhaust air move up and down by the revolution of one cam 14 for actuation, and is equipped with the same swing arm 20 as the 1st example of the above.

[0040] The both ends of the cam shaft 13 for a splash which the engagement member 22 for a splash of the

shape of a fork whose cam 14 for projection actuation is pinched is formed in the direction of the cam 14 for actuation at the splash cam 12 of a couple and one, and insisted upon the splash cam 12 in the top face of the splash cam 12 are held at the plane view horseshoe-shaped frame 19.

[0041] Although the graphic display is omitted, the driving means to which it becomes from oil pressure or a worm gearing, and a frame 19 is moved like the 1st example of the above is established, and the splash cam migration means to which the center of oscillation of the splash cam 12 is moved by this driving means and the above-mentioned frame 19 is constituted. Therefore, if a frame 19 is moved by operating the above-mentioned driving means, it moves so that cam side 12a of the splash cam 12 may move along with pressed field 21a of a swing arm 21, and the center of oscillation of the cam shaft 13 for a splash, as a result the splash cam 12 is constituted so that the closing motion timing of a bulb 10 may change in connection with this.

[0042] Drawing 7 shows the valve timing control unit of the engine concerning the 3rd example of this invention.

[0043] \*\*\*\* 3 example is a type with which the splash cams 12 and 12 of a left Uichi pair rock, and the object for two inhalation of air or the bulbs 10 and 10 for exhaust air move up and down in connection with this by the revolution of one cam 14 for actuation.

[0044] In \*\*\*\* 3 example, although the arm 18 for a splash prolonged to the direction of the cam 14 for actuation among the splash cams 12 and 12 of a left Uichi pair is formed in the splash cams 12 and 12 of a left Uichi pair, and one, the roller 16 formed in the 1st example is not formed. For this reason, the slide contact side with the cam 14 for a splash in the arm 18 for a splash is formed in the shape of radii, and it is formed so that the arm 18 for a splash may rock smoothly with rotation of the cam 14 for a splash.

[0045] The both ends of the cam shaft 13 for a splash which insisted upon the splash cams 12 and 12 and the arm 18 for a splash of a left Uichi pair are held free [ a revolution ] at the plane view horseshoe-shaped frame 19 as a splash cam attachment component, and this frame 19 is held free [ both-way migration ] to the shaft orientations of a bulb 10 at the engine. The end section of the thread part material 27 prolonged in the direction, i.e., the both-way migration direction of a frame 19, which intersects perpendicularly with this center-section 19a is screwing in center-section 19a of a frame 19, and the pinion 28 rotated to the circumference of the axial center of this thread part material 27 is formed in the other end of this thread part material 27. If it has geared with Lack 29 and Lack 29 reciprocates in the direction of arrow-head I, a pinion 28 will be interlocked with this reciprocating motion, and will be rotated in the direction of arrow-head RO. The disk 30 is formed in the center section of the thread part material 27 at the thread part material 27 and one, and this disk 30 is held by the screw attachment component 31 in pivotable and the direction of a thread part axis of member at migration impossible.

[0046] The splash cam migration means to which the center of oscillation of the splash cam 12 is moved by the frame 19 explained above, the thread part material 27, the pinion 28, Lack 29, the disk 30, and the screw attachment component 31 is constituted. If Lack 29 is moved in the direction of arrow-head I, in order that a pinion 28 may rotate in the direction of arrow-head RO and the thread part material 27 may move to the shaft orientations in connection with this, It moves in the direction which intersects perpendicularly with a bulb 10 in the center of oscillation of a frame 19, as a result the splash cam 12, and the closing motion timing of a bulb 10 changes.

[0047] Drawing 8 shows the valve timing control unit of the engine concerning the 1st modification of the 3rd example, and explanation is omitted by attaching the same sign about the same member as the 3rd example.

[0048] In this 1st modification to center-section 19a of the frame 19 as a splash cam attachment component The eccentric strap 32 as 2nd eccentric member which has the cross section of a long ellipse form in the vertical direction, and has center-section 19a of a frame 19 and breakthrough 32a prolonged in parallel is formed in a frame 19 and one. the interior of breakthrough 32a of this eccentric strap 32 -- the eccentric sheave 33 as 1st eccentric member -- an eccentric strap 32 -- receiving -- relativity -- it is prepared pivotable, and it insists upon this eccentric sheave 33 so that it may rotate, where eccentricity is carried out to a revolving shaft 34 to the medial axis of this revolving shaft 34. In addition, the revolving shaft 34 is pivotable by the turning effort which introduced the turning effort of the electric motor which is not illustrated, or the turning effort of the cam shaft 15 for actuation through the clutch device etc.

[0049] If the splash cam migration means to which the center of oscillation of the splash cam 12 is moved is constituted by the frame 19 explained above, the eccentric strap 32, the eccentric sheave 33, and the revolving shaft 34 and a revolving shaft 34 is rotated in the direction of arrow-head Ha In order that an eccentric sheave 33 may be rotated in the direction of arrow-head Ha where eccentricity is carried out to a



revolving shaft 34, and an eccentric strap 32 may move in the direction of arrow-head NI in connection with this, it moves in the direction which intersects perpendicularly with a bulb 10 in the center of oscillation of a frame 19, as a result the splash cam 12, and the closing motion timing of a bulb 10 changes.

[0050] Drawing 9 shows the valve timing control unit of the engine concerning the 2nd modification of the 3rd example, and explanation is omitted by attaching the same sign about the same member as the 3rd example.

[0051] In this 2nd modification, to center-section 19a of the frame 19 as a splash cam attachment component, Lack 35 prolonged in the direction which has spur gear 35a on the top face, and intersects perpendicularly with center-section 19a of a frame 19 was formed in one, and this rack 35 has geared with the pinion 36 which has spur gear 36a on the underside, and was held free [ a revolution ] on it at the revolving shaft 37. In addition, the revolving shaft 37 is pivotable by the turning effort which introduced the turning effort of the electric motor which is not illustrated, or the turning effort of the cam shaft 15 for actuation through the clutch device etc.

[0052] If the splash cam migration means to which the center of oscillation of the splash cam 12 is moved is constituted by the frame 19 and Lack 35 who explained above, the pinion 36, and the revolving shaft 37 and a revolving shaft 37 is rotated in the direction of arrow-head HO, in order that it may rotate in the direction of arrow-head HO and Lack 35 may also move a pinion 36 in the direction of arrow-head HE in connection with this, it moves in the direction which intersects perpendicularly with a bulb 10 in the center of oscillation of a frame 19, as a result the splash cam 12.

[0053]

[Effect of the Invention] As explained above, according to the valve timing control unit of the engine concerning invention of claim 1 Since the splash cam migration means to which the center of oscillation of a splash cam is moved was established so that the closing motion timing of the bulb for inhalation of air or the bulb for exhaust air might change, Since the include angle of a splash cam changes with migration of the center of oscillation of a splash cam and the field which \*\*\*\*s on the bulb for inhalation of air or the bulb for exhaust air in a cam side of a splash cam in connection with this changes, the closing motion timing of the bulb for inhalation of air or the bulb for exhaust air can be changed certainly.

[0054] Moreover, since management of the path clearance of a slide contact part becomes easy and its rigidity of the transfer system of the force improves while mechanical resistance reduces a splash cam, since a direct drive is carried out by the cam for actuation and slide contact parts decrease in number, its engine revolution limitation improves.

[0055] For this reason, according to invention of claim 1, where improvement in positive actuation and an engine revolution limitation is secured, engine valve timing is controllable.

[0056] In order according to invention of claim 2 to arrange a swing arm between the bulb for inhalation of air or the bulb for exhaust air, and a splash cam and to make this swing arm rock by the splash cam, Since the part which it is only that the parts which press the pressed field of the swing arm in the cam side of a splash cam differ, and presses the bulb for inhalation of air or the bulb for exhaust air in a swing arm does not change even if the center of oscillation of a splash cam moves The lift actuation by which the bulb for inhalation of air or the bulb for exhaust air was stabilized can be obtained.

[0057] According to invention of claim 3, in pinion \*\*\*\*\*, if both-way actuation of Lack is carried out in the direction vertical to the slide contact migration direction, since thread part material rotates, it follows in footsteps of this and a splash cam attachment component reciprocates in the slide contact migration direction, since the center of oscillation of a splash cam also reciprocates in the slide contact migration direction, the include angle of a splash cam will change, and the closing-motion timing of the bulb for inhalation of air or the bulb for exhaust air will change certainly in connection with this.

[0058] According to invention of claim 4, if revolution actuation of the revolving shaft is carried out, the 1st eccentric member will rotate, it follows in footsteps of this, and since a splash cam attachment component reciprocates in the slide contact migration direction, since the center of oscillation of a splash cam also reciprocates in the slide contact migration direction, the include angle of a splash cam changes, and, as for the 2nd eccentric member \*\*\*\*\*, the closing motion timing of the bulb for inhalation of air or the bulb for exhaust air changes certainly in connection with this.

[0059] Since according to invention of claim 5 a pinion will rotate, it will follow in footsteps of this and Lack, as a result a splash cam attachment component will reciprocate in the slide contact migration direction if revolution actuation of the revolving shaft is carried out, since the center of oscillation of a splash cam also reciprocates in the slide contact migration direction, the include angle of a splash cam changes, and the closing motion timing of the bulb for inhalation of air or the bulb for exhaust air changes certainly in

connection with this.

---

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

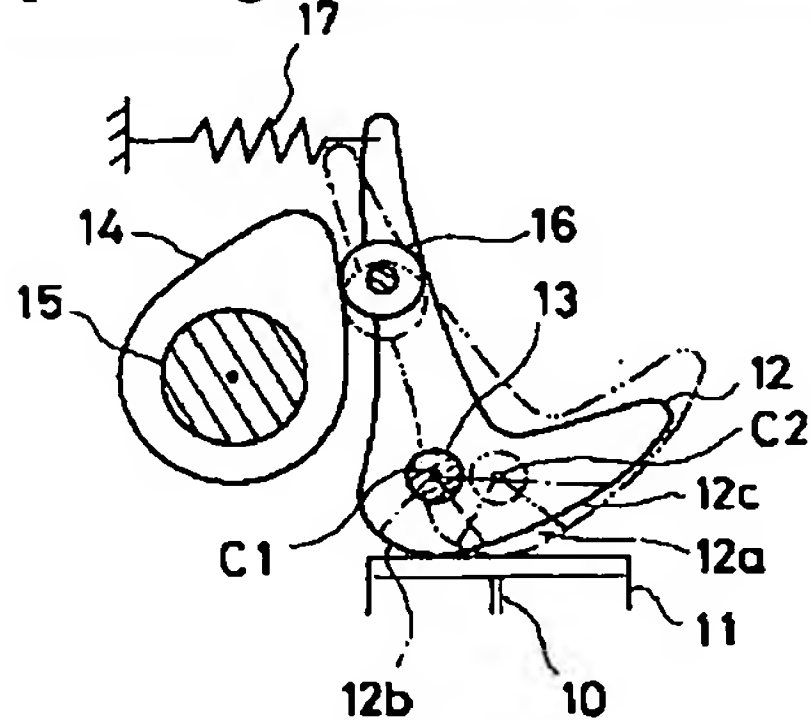
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

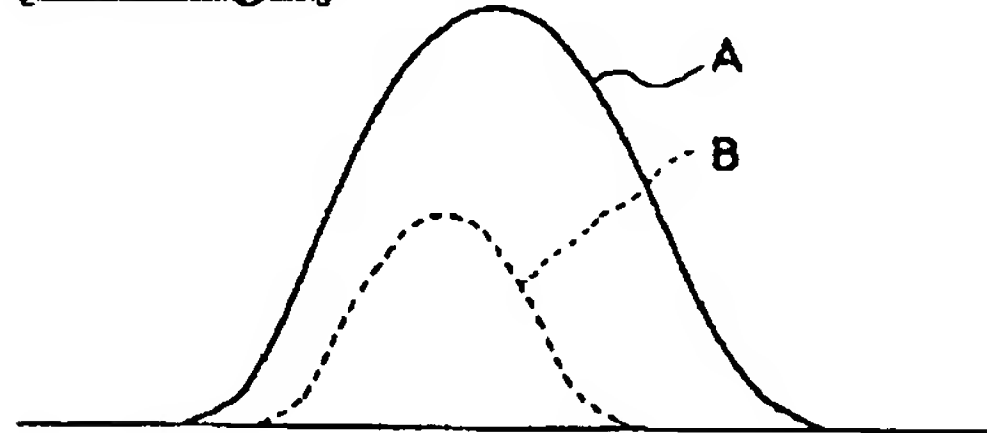
DRAWINGS

---

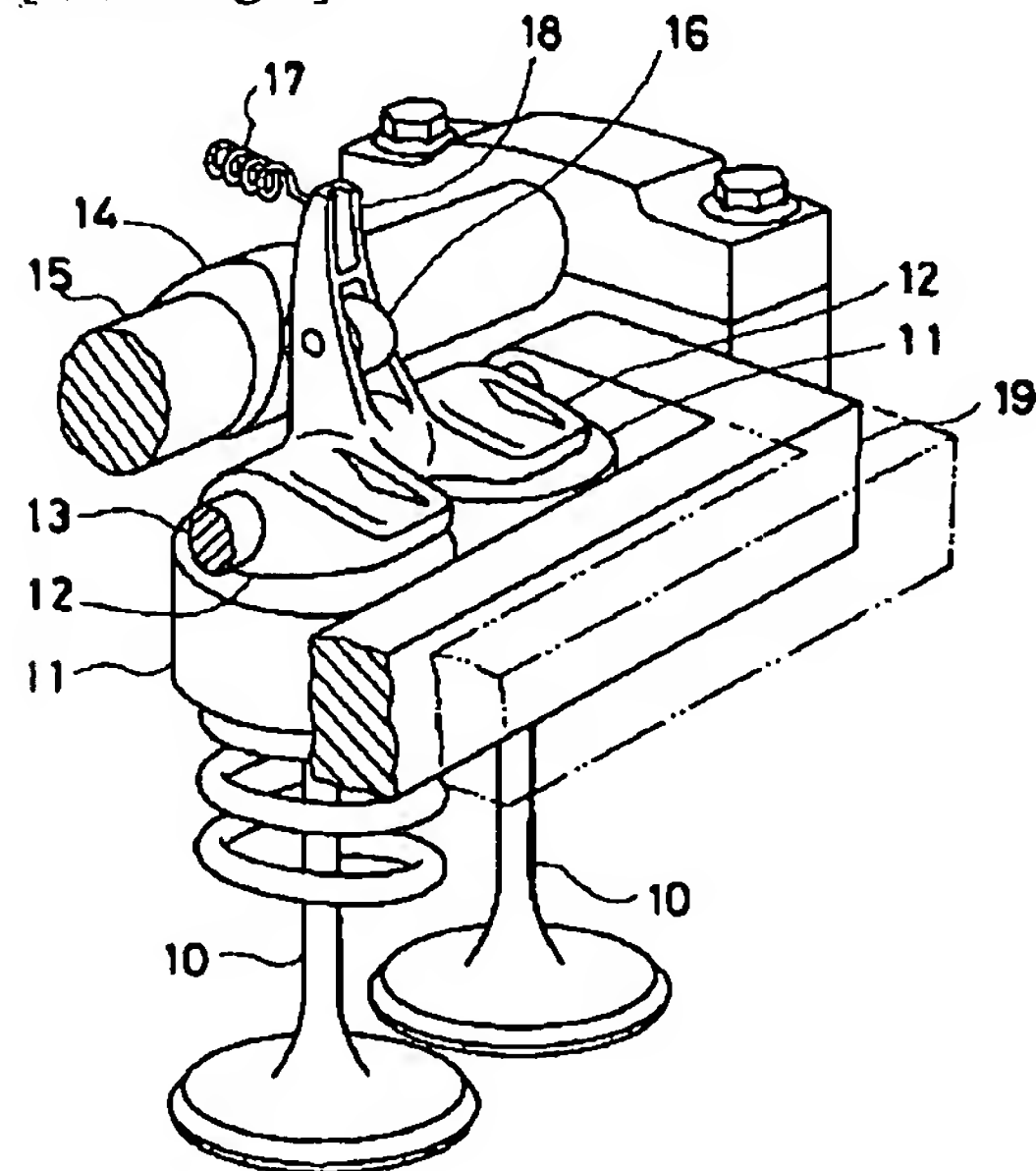
[Drawing 1]



[Drawing 2]

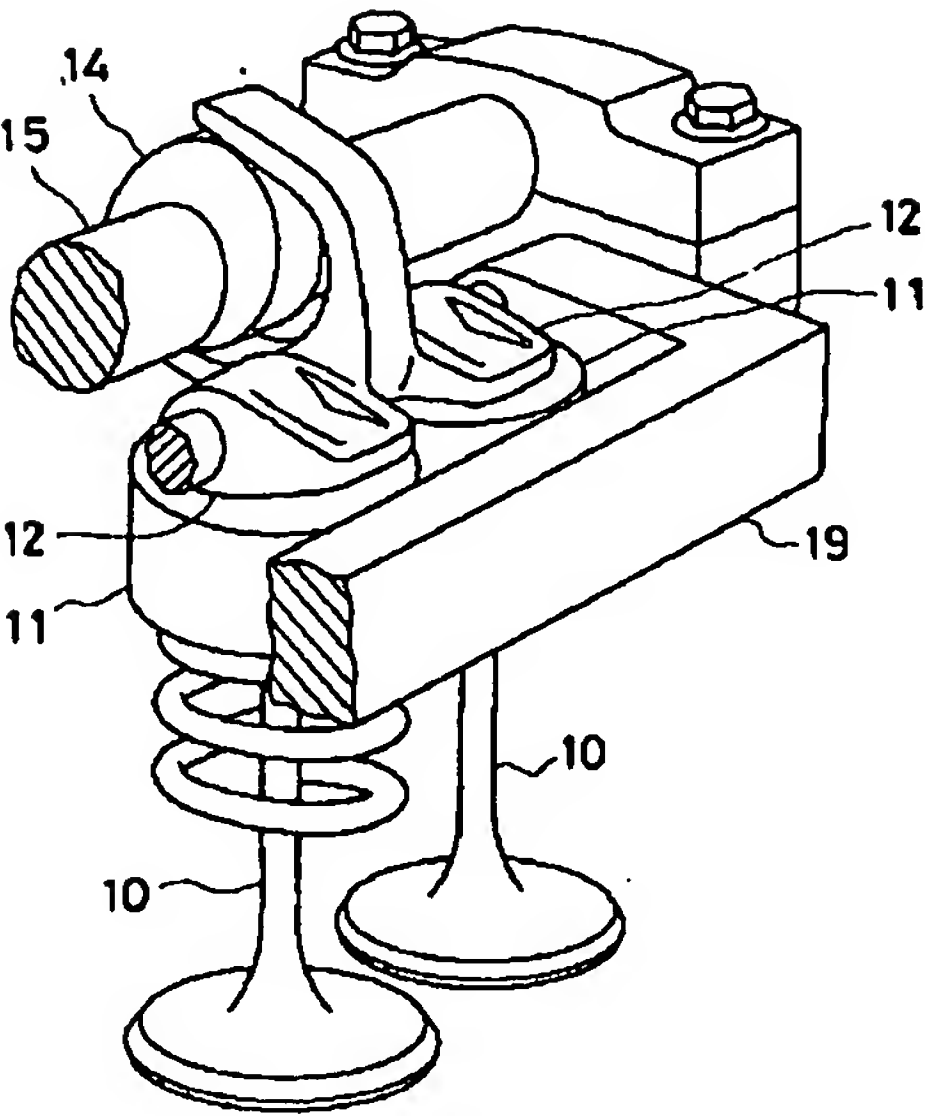


[Drawing 3]

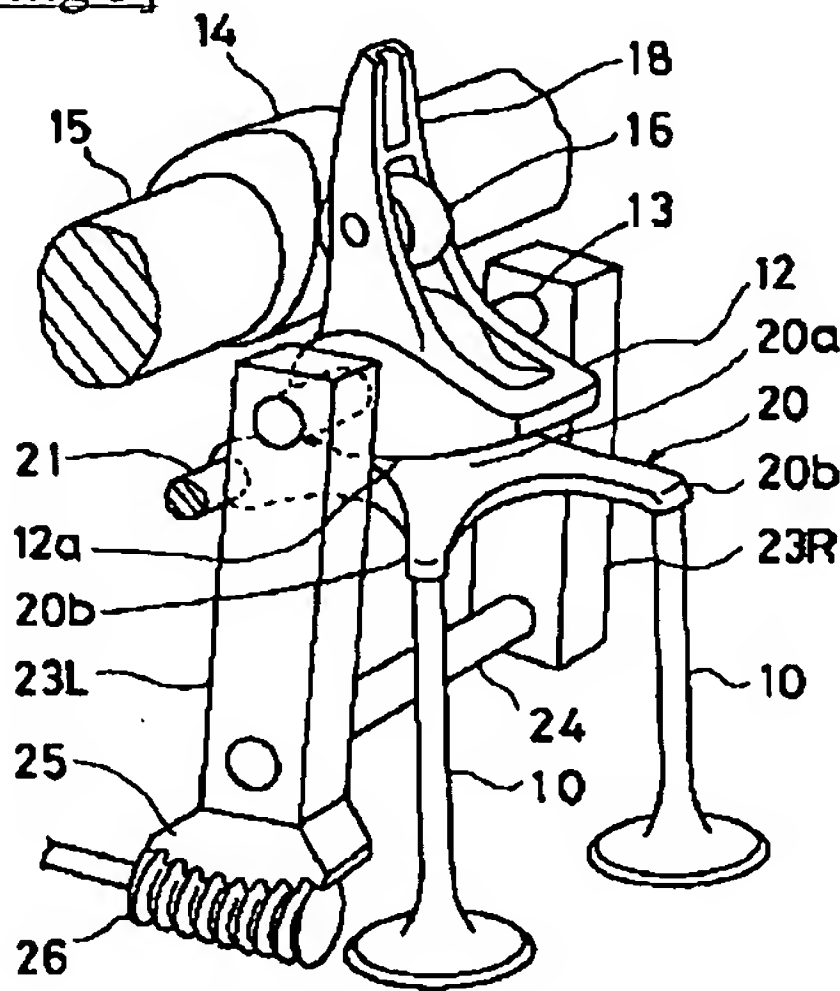


[Drawing 4]

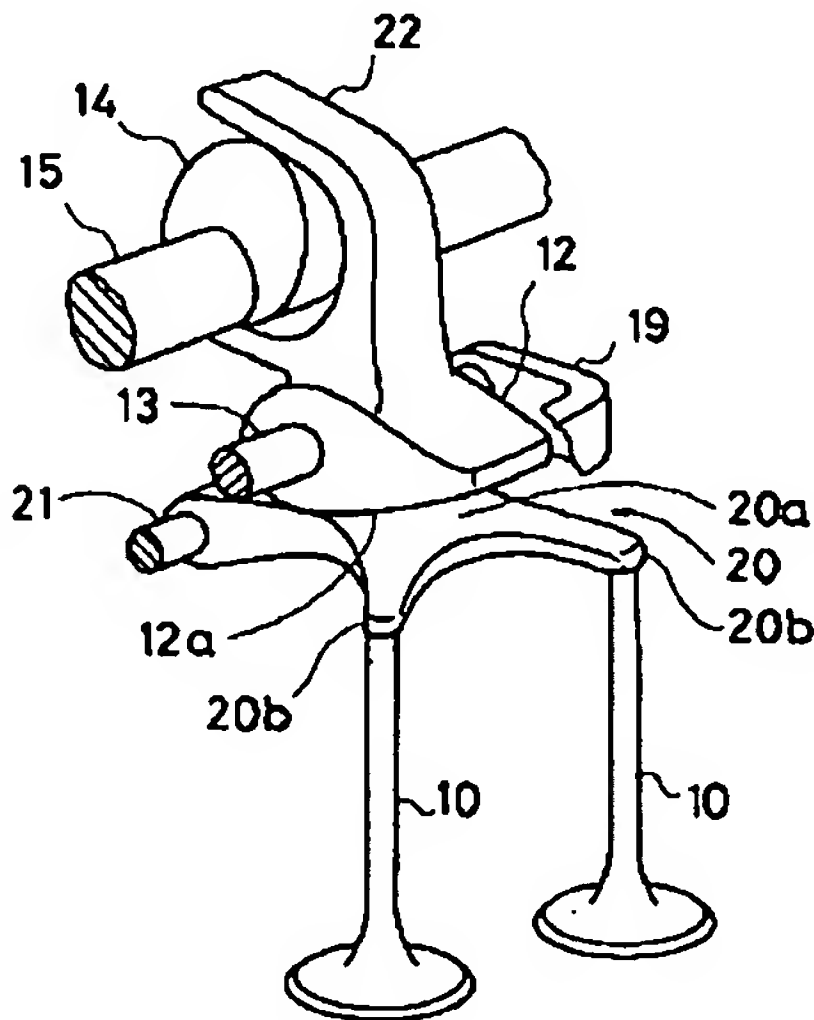




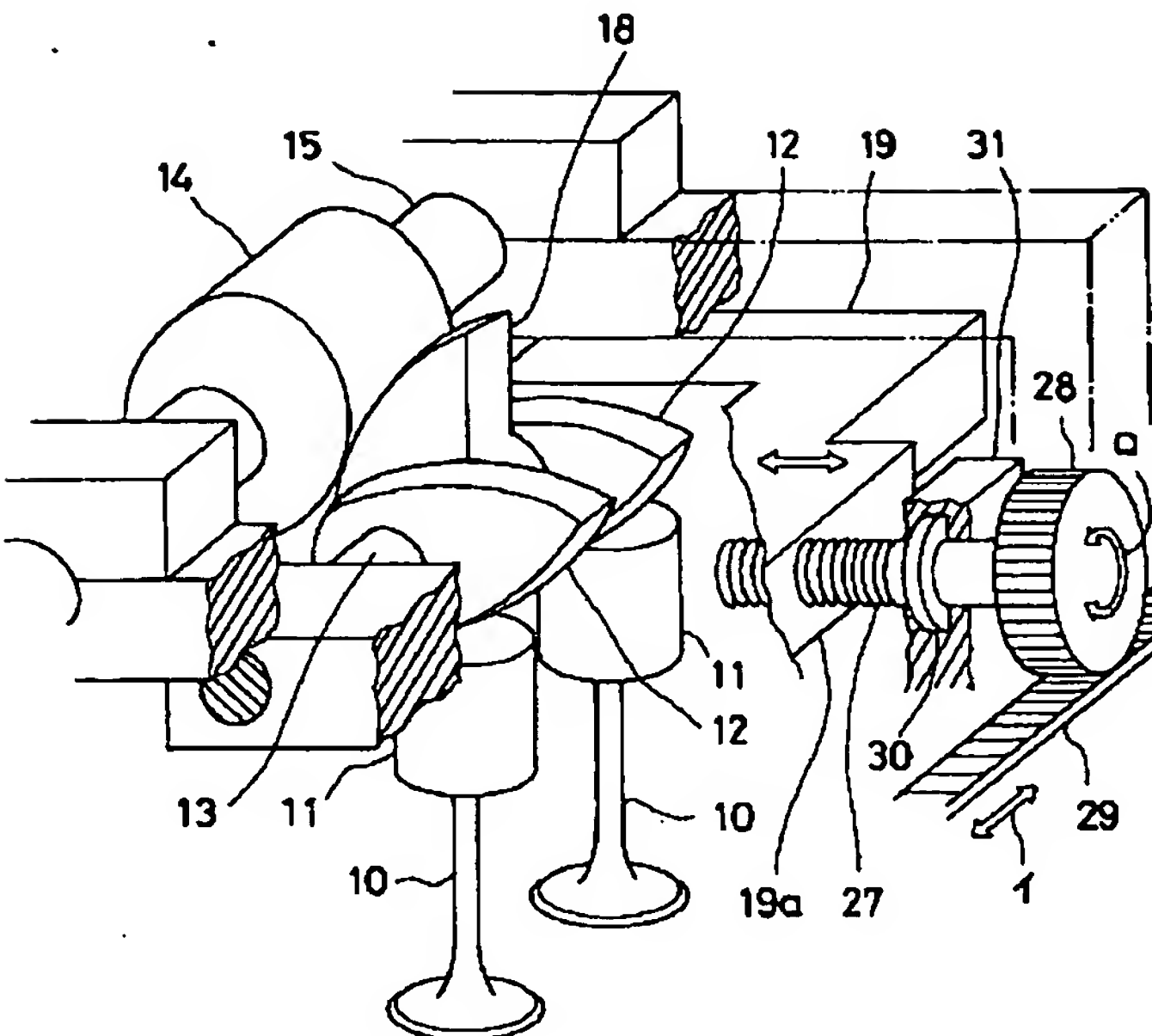
[Drawing 5]



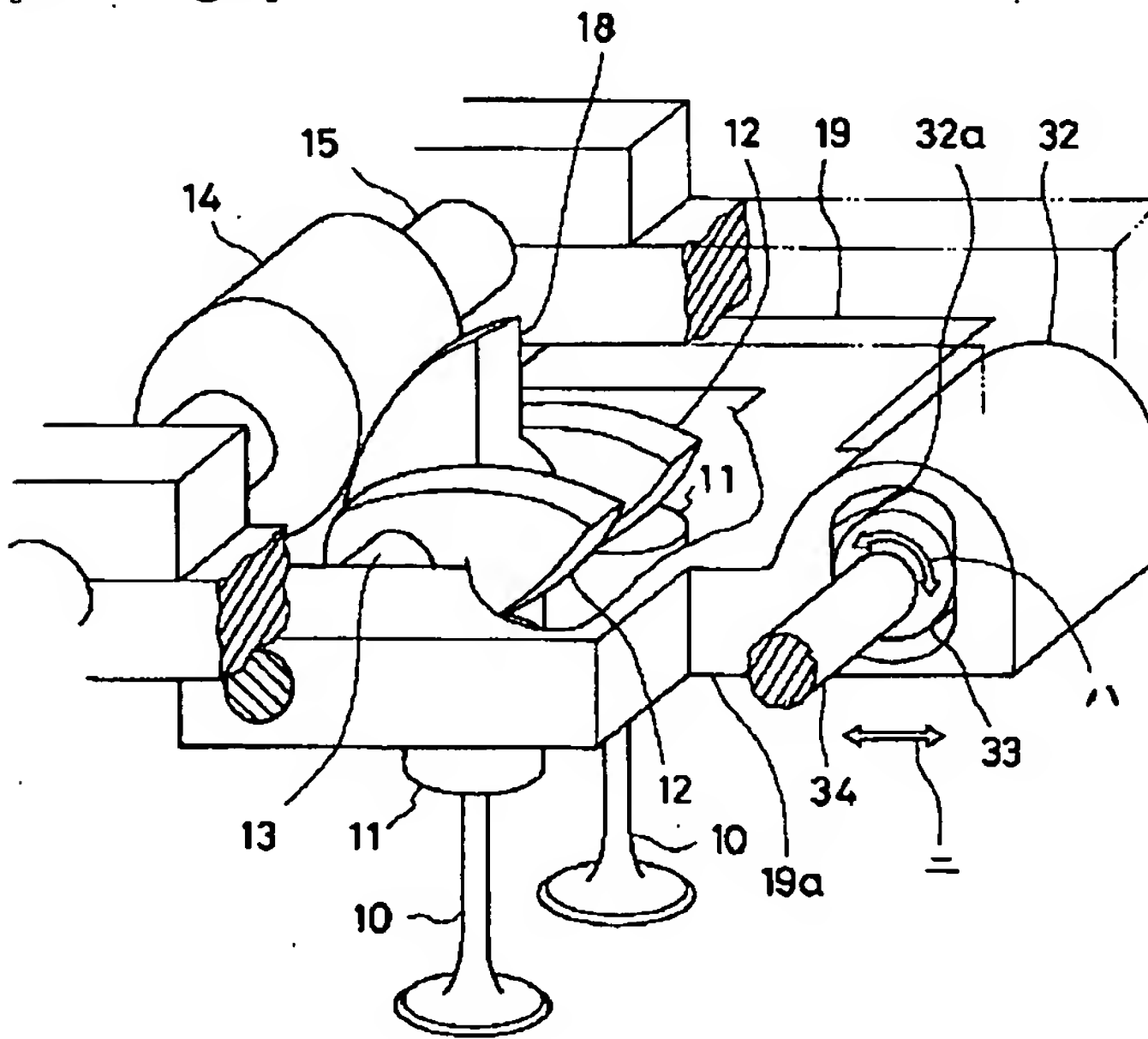
[Drawing 6]



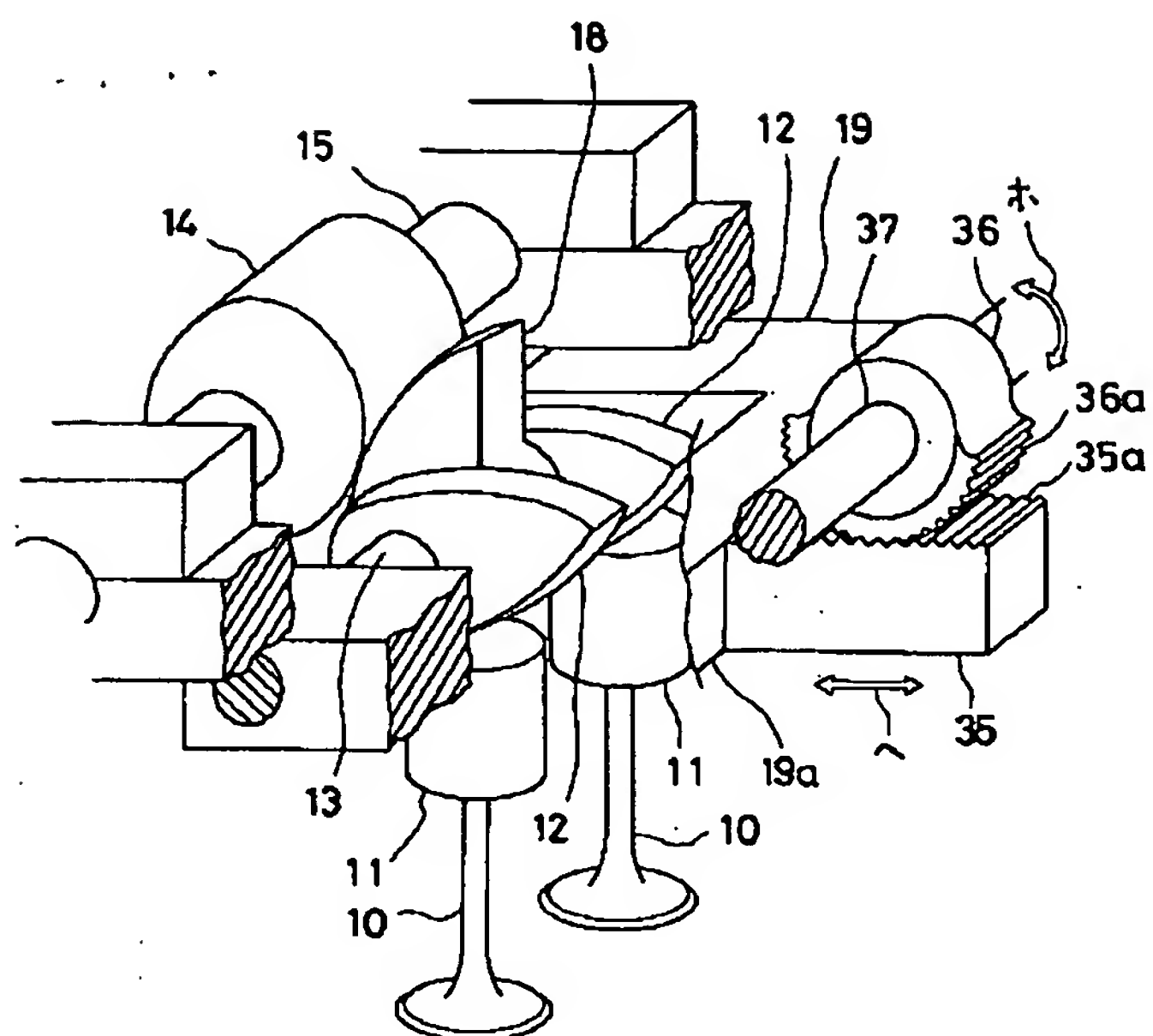
[Drawing 7]



[Drawing 8]



[Drawing 9]



[Translation done.]